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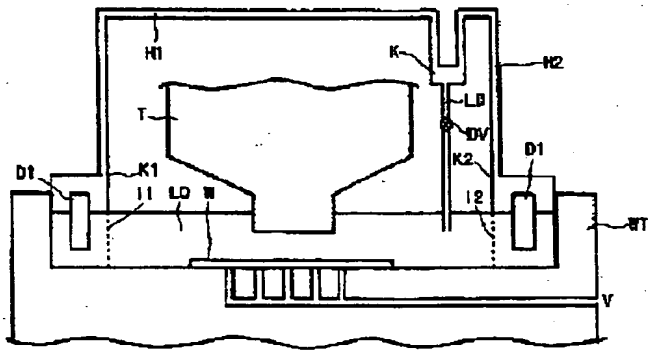
APPLICANT : NIKON CORP;

INVENTOR : KUDO TAKETO;

INT.CL. : H01L 21/027 G03F 7/20

TITLE : ALIGNER, ITS MANUFACTURE, EXPOSING METHOD AND DEVICE MANUFACTURING METHOD



ABSTRACT : PROBLEM TO BE SOLVED: To enable continuous correction of imaging performance without vibration, by installing a refractive index adjusting means for adjusting the refractive index of liquid.

SOLUTION: A refractive index adjusting means consists of the following; electrodes D1, ion exchange films 11, 12, bulkheads K1, K2, exhaust pipes H1, H2, a mixer K, an electromagnetic valve DV, an introducing pipe LD, a power source supply part and a second control part. The second control part sends a command to the power source supply part, and applies 8 specified voltage for a specified period across the two electrodes D1. From one electrode turning to an anode, oxygen gas is generated. From the other electrode turning to a cathode, mixed gas of hydrogen and chlorine is generated. Since the concentration of hydrogen chloride in liquid LQ is decreased, the refractive index of the liquid LQ is decreased. The second control part sends a command to the electromagnetic valve DV, in order to open the valve DV and add high concentration admixture aqueous solution to the liquid LQ. Thereby the refractive index of the liquid LQ is increased.

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ALIGNER AND ITS MANUFACTURING METHOD AND EXPOSURE METHOD AND DEVICE PRODUCTION METHOD

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G03F 7/20 521
[FI]
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Parties

Applicants

(71) ･出願人･

･識別番号･

･････････

･氏名又･名称･

株式会社･･･

･住所又･居所･

東京都千代田区丸･内･丁目･番･号

Inventors

(72) ･発明者･

･氏名･

工藤 威人

･住所又･居所･

東京都千代田区丸･内･丁目･番･号 株式会社･･･内

Abstract

(57) ･要約･

･課題･

･連続的･結像性能･補正･振動･伴････

･可能･･････或･･投影光学系･開口数･増大及･結像性能･補正･両立････

･解決手段･

････ R 上･設･･････････照明･･照明光学系 IL ･･････････像･感光性基板上･形成･･投影光学系 T ･･有･･投影光学系･感光性基板･･間･光路中･少････一部分･位置･･液体 LQ ･介･･露光･行･露光装置･････液体･屈折率･調整･････屈折率調整手段･有･･･

(22) [Application Date]

1997 (1997)June 10*

(71) [Applicant]

[Identification Number]

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[Name]

NIKON CORPORATION (DB 69-055-0868)

[Address]

Tokyo Chiyoda-ku Marunouchi 3-2-3

(72) [Inventor]

[Name]

Kudo **

[Address]

Tokyo Chiyoda-ku Marunouchi 3-2-3 Nikon Corporation (DB 69-055-0868) *

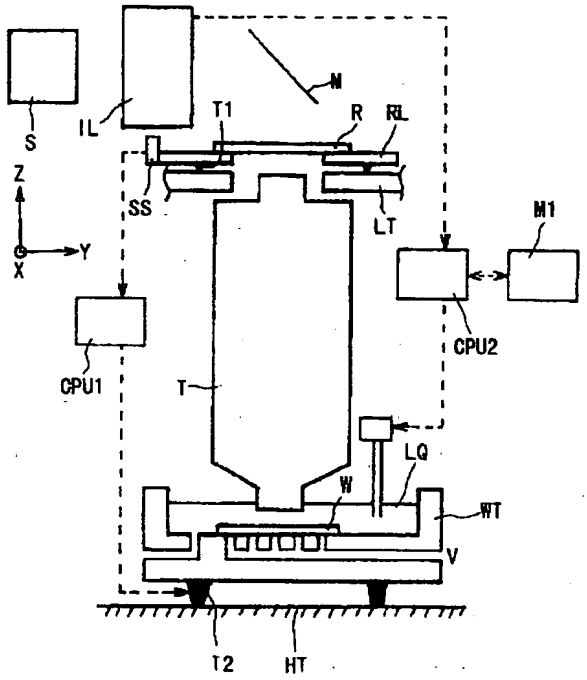
(57) [Abstract]

[Problems to be Solved by the Invention]

correction of continuous imaging performance is made possible without accompanying thevibration, or both achievements do correction of increase and imaging performance of the number of openings of projection optical system

[Means to Solve the Problems]

It possesses projection optical system T which forms image of illuminating optical system IL and this pattern which pattern which is provided on reticle R illumination aredone on photosensitive group sheet , in light path between projection optical system and photosensitive group sheet atleast through liquid LQ which to position of portion is, with the aligner which exposes, it possesses index of refraction adjustment means inorder to adjust index of refraction of liquid .



Claims

特許請求・範囲・

請求項 1・

・・・・上・設・・・・・・・・・照明・・照明光学系・・該・・・・・像・感光性基板上・形成・・投影光学系・・有・・前記投影光学系・前記感光性基板・・間・光路中・少・・・・一部分・位置・・液体・介・・露光・行・露光装置・・・・・

前記液体・屈折率・調整・・・・・屈折率調整手段・有・・・・・特徴・・・露光装置・

請求項 2・

前記屈折率調整手段・・前記投影光学系・結像性能・補正・・・・・前記液体・屈折率・調整・・・・・特徴・・・請求項 1 記載・露光装置・

請求項 3・

前記投影光学系・結像性能・測定・・結像性能測定手段・・・・備・・

[Claim(s)]

[Claim 1]

In aligner which possesses projection optical system which forms image of the illuminating optical system and said pattern which pattern which is provided on reticle the illumination are done on photosensitive group sheet , in light path between aforementioned projection optical system and aforementioned photosensitive group sheet at least through liquid which toposition of portion is, exposes,

aligner . which possesses index of refraction adjustment means in order toadjust index of refraction of aforementioned liquid and makes feature

[Claim 2]

Aforementioned index of refraction adjustment means , in order correction to do imaging performance of aforementioned projection optics , adjusts index of refractionof aforementioned liquid aligner . which is stated in Claim 1 which is made feature

[Claim 3]

imaging performance measuring means which measures imaging performance of aforementioned projection optical system furthermore having,

前記屈折率調整手段・・前記結像性能・補正・・・・・前記液体・屈折率・調整・・・・・特徴・・・請求項２記載・露光装置・

Aforementioned index of refraction adjustment means , in order correction to doaforementioned imaging performance , adjusts index of refraction of theaforementioned liquid aligner . which is stated in Claim 2 which is made feature

・請求項４・

[Claim 4]

前記投影光学系・結像性能・変動・要因・状態・検知・・変動要因検知手段・・・・備・・

Fluctuation factor detection means which detects state of factor offluctuation of imaging performance of aforementioned projection optical system furthermorehaving,

前記屈折率調整手段・・前記要因・状態・応・・・前記結像性能・補正・・・・・前記液体・屈折率・調整・・・・・特徴・・・請求項 1 記載・露光装置・

Aforementioned index of refraction adjustment means in order correction to doaforementioned imaging performance according to state of aforementioned factor , adjusts index of refraction of aforementioned liquid the aligner . which is stated in Claim 1 which is made feature

・請求項５・

[Claim 5]

前記照明光学系・・前記・・・・・対・・照明条件・変更可能・構成・・・

Aforementioned illuminating optical system configuration is done illumination condition for theaforementioned reticle in changeable ,

前記変動要因検知手段・・前記照明条件・状態・検知・・

Aforementioned fluctuation factor detection means detects state of theaforementioned illumination condition ,

前記屈折率調整手段・・前記照明条件・変更・応・・・前記結像性能・補正・・・・・前記液体・屈折率・調整・・・・・特徴・・・請求項４記載・露光装置・

Aforementioned index of refraction adjustment means in order correction to doaforementioned imaging performance according to modification of theaforementioned illumination condition , adjusts index of refraction of theaforementioned liquid aligner . which is stated in Claim 4 which is made feature

・請求項６・

[Claim 6]

前記変動要因検知手段・・前記・・・・・種類・判別・・・・・・・・

As for aforementioned fluctuation factor detection means , being something whichdistinguishes types of aforementioned reticle ,

前記屈折率調整手段・・前記・・・・・種類・応・・・前記結像性能・補正・・・・・前記液体・屈折率・調整・・・・・特徴・・・請求項４記載・露光装置・

Aforementioned index of refraction adjustment means in order correction to doaforementioned imaging performance according to types of aforementioned reticle , adjusts index of refraction of aforementioned liquid the aligner . which is stated in Claim 4 which is made feature

・請求項７・

[Claim 7]

前記感光性基板・保持・・感光性基板・・・・・・・・備・・

photosensitive group sheet holder which keeps aforementioned photosensitive group sheet furthermore having,

該感光性基板・・・・・・前記投影光学系・前記感光性基板・・間・光路・前記液体・満・・・・・側壁・・前記液体・前記感光性基板・・・・・供給・・・共・前記感光性基板・・・・・・回収・・・・・供給・回収・・・・・備・・・・・特徴・・・請求項１乃至６・何・・一項記載・露光装置・

Either of Claims 1 through 6 to which said photosensitive group sheet holder , as aforementioned projection optical system and sidewall and aforementioned liquid in order to fill up the light path between aforementioned photosensitive group sheet with aforementioned liquid are supplied to aforementioned photosensitive group sheet holder , has supply & recovery unit in order to recover from aforementioned photosensitive group sheet holder and makes feature aligner .

請求項 8・

前記屈折率調整手段・・前記液体・屈折率・調整・・・・・添加剤・供給・・添加剤供給・・・・・前記液体・・前記添加剤・回収・・・・・添加剤回収・・・・・有・・・・・特徴・・・請求項 1 乃至 7 ・何・・一項記載・露光装置・

which is stated in one section

[Claim 8]

As for aforementioned index of refraction adjustment means , from additive supply unit and aforementioned liquid which supply additive in order to adjustindex of refraction , aforementioned liquid aforementioned additive either of Claim 1 to 7 which possesses additive recovery unit in orderto recover and makes feature aligner . which is stated in onesection

請求項 9・

所定・照明条件・・・・・・・・・照明・・工程・・前記・・・・上・設・・・・・・・・・投影光学系・用・・感光性基板・転写・・工程・・含・・前記投影光学系・・・光・所定・液体・介・・前記感光性基板・導・露光方法・・・・・

[Claim 9]

In origin of predetermined illumination condition pattern which is provided on step. aforementioned reticle which reticle illumination is done including the step which copies to photosensitive group sheet making use of projection optical system , in exposure method which through predetermined liquid , leads light from aforementioned projection optical system toaforementioned photosensitive group sheet ,

前記投影光学系・結像性能・補正・・・・・前記液体・屈折率・調整・・工程・含・・・・特徴・・・露光方法・

exposure method . which includes step which adjusts index ofrefraction of aforementioned liquid in order correction to do the imaging performance of aforementioned projection optical system , and makes feature

請求項 10・

所定・照明条件・・・・・・・・・照明・・工程・・前記・・・・上・設・・・・・・・・・・・・投影光学系・用・・感光性基板・転写・・工程・・含・・前記投影光学系・・・光・所定・液体・介・・前記感光性基板・導・・・・・製造方法・・・・・

[Claim 10]

In origin of predetermined illumination condition device pattern which is provided on step. aforementioned reticle which reticle illumination is done including the step which is copied to photosensitive group sheet making use of projection optical system , light fromaforementioned projection optical system through predetermined liquid , regarding to device production method which it leads to aforementioned photosensitive group sheet ,

前記・・・・及・前記照明条件・・・少・・・一方・変更・・・・・・前記液体・屈折率・変更・・・・・特徴・・・・・・・・製造方法・

When aforementioned reticle and inside at least one of theaforementioned illumination condition is modified, index of refraction of theaforementioned liquid is modified device production method . which is madefeature

請求項 11・

・・・・上・設・・・・・・・・・照明・・照明光学系・・該・・・・・像・感光性基板上・形成・・投影光学系・・有・・前記投影光学系・前記感光性基板・・間・光路中・少・・・・一部分・位置・・液体・介・・露光・行・露光装置・製造方法・・・・・

[Claim 11]

In manufacturing method of aligner which possesses projection optical system which forms theimage of illuminating optical system and said pattern which pattern which is provided on reticle illumination are done on photosensitive group sheet , in light path between theaforementioned projection optical system and aforementioned photosensitive group sheet at least through the liquid which to position of portion is, exposes,

前記投影光学系・結像性能・測定・・工程・・

step. which measures imaging performance of aforementioned projection optical system

該測定・・・結像性能・基・・・・前記液体・屈折率・初期値・定・・工程・・含・・・・

manufacturing method . of aligner which includes step which decides the initial value of index of refraction of

特徴・・・露光装置・製造方法・

Specification

・発明・詳細・説明・

・0001・

・発明・属・・技術分野・

本発明・・・・・・上、・設・・・・・・・・・・・・・・・・感光性基板上・投影・・投影光学系・備・・露光装置及・該露光装置・用・・露光方法並・・・・・・製造方法・関・・・

・・・詳・・・・本発明・投影光学系・感光性基板・・間・光路・液体・充填・・液浸型露光装置・関・・・

本発明・・半導体素子・撮像素子(CCD 等)・液晶表示素子・・・・薄膜磁気・・・等・製造・・際・好適・・・・・・・

・0002・

・従来・技術・

光学系・最終面・像面・・間・空間・・・・・・・・・・・・・言・・・従来・露光装置・投影光学系・・・・・・・・・・・・・・・空気・満・・・・・・

・・・・・IC・LSI・製造・・過程・於・・・・・・・工・・露光・・・・・・・・・・微細化・常・望・・・・・・・・・・・・露光・用・・光・波長・短・・・・・・・・・像側・開口数・大・・・・必要・・・・

光・波長・短・・・・・・・満足・・・結像性能・得・・露光・満足・光量・確保・・・・・・透過率・持・・・・材料・少・・・・・・・・

・0003・

・・・像面・・・最終媒質・・空気・・屈折率・大・・・液体・・・・・・像側・開口数・大・・・・・・・提案・・・・・・・・・・・液体・用・・投影光学系・持・露光装置・・液浸型露光装置・呼・・・・・・

・・・露光装置・・・・・・投影光学系・結像性能・補正・・・・・・投影光学系・最・物体側・光路或・・最・像側・光路中・・結像性能・調整・・・・・結像性能補正部材・交換可能・設・・技術・知・・・・・・

aforementioned liquid and said on basis of imaging performance which was measured, makes feature

[Description of the Invention]

[0001]

[Technological Field of Invention]

As for this invention, device pattern being provided on reticle it regards the exposure method and device production method which use aligner and said aligner which have the projection optical system which projection is done on photosensitive group sheet .

Furthermore as for details, as for this invention liquid it regards the liquid dampen type aligner which is filled in light path between projection optical system and photosensitive group sheet .

this invention, when semiconductor element , image pickup element (CCD array etc), producing liquid crystal display element , or thin film magnetic head etc, is preferred ones.

[0002]

[Prior Art]

[waakingudisutansu] With it is final aspect of optical system and space between the image plane , but with projection optical system of conventional aligner as for [waakingudisutansu] it was filled upwith air .

By way, regarding to process which produces IC and LSI , pattern which it exposes to silicon wafer , narrowing being always desired, forthat makes light wavelength which is used for exposure short, or is necessaryto enlarge number of openings of image side.

As light wavelength becomes short, while obtaining imaging performance which it can besatisfied glass material which has sufficient transmittance which can guarantee satisfactory light intensity in exposure decreases.

[0003]

final medium to image plane , number of openings of image side is enlarged by thefact that index of refraction it is larger than air , makes the liquid being proposed , that way aligner which has projection optical system which uses liquid is called liquid dampen type aligner then.

Well, in order correction to do imaging performance of projection optical system , most light path of object side of projection optical system or most technology which provides imaging performance corrected part material in order to adjust imaging performance in light path of image side, in exchangeable has been known regarding aligner .

'0004'

'発明'解決'''''課題'

'''''液浸型露光装置''''投影光学系'感光性基板''間'光路('''''''''')'液体'満''構成'''''結像性能'補正'''''部材'配置'''''困難'''''

''''''''結像性能補正部材''有限'数'現実的'装置'構成'考''''数個程度''準備''''''''''''離散的'''結像性能'補正''''問題点''''

'0005'

''''投影光学系'結像性能'所定'許容範囲'収''必要''''上述''''結像性能'補正'離散的''''''''''''''所定'許容範囲内'収'''''困難'''''

特''露光'''''微細化'露光面積'増大'求''''''''結像性能'許容範囲'狭''''''''''''感光性基板''走査''''露光'行'走査露光方法'行'場合''結像性能特性'変動幅'許容範囲'狭''''''''離散的'補正''対応''''''''

'0006'

''''上述''''結像性能補正部材'交換時''''''投影光学系自体'振動'発生''''結像性能'悪影響'生''恐'''''

''''本発明''連続的'結像性能'補正'振動'伴''''可能''''''第 1 '目的'''''

''''本発明''投影光学系'開口数'増大'結像性能'補正''''''両立'第 2 '目的'''''

'0007'

'課題'解決'''''手段'

上述'第 1 '目的'達成'''''本発明''''露光装置''''''上'設''''''''照明''照明光学系''''''''''像'感光性基板上'形成''投影光学系''有''投影光学系'感光性基板''間'光路中'少''''一部分'位置''液体'介''露光'行'露光装置''''''液体'屈折率'調

[0004]

[Problems to be Solved by the Invention]

But, with liquid dampen type aligner , because it is a configuration whichfills up liquid in light path ([waakingudisutansu]) between projection optical system and photosensitive group sheet ,member in order correction to do imaging performance is arranged is difficult.

In addition, because when quantity of finite , of configuration of theactual device is thought, only several extent prepares this kind of imaging performance corrected part material and, is possible , in only discrete imaging performance thereis a problem which correction it is not possible.

[0005]

In addition, imaging performance of projection optical system it is necessary to store to the predetermined tolerance , but above-mentioned way if correction of imaging performance ispossible to only discrete , you supply inside this predetermined tolerance , itbecomes difficult.

Especially, when it can seek narrowing of exposure pattern and increaseof exposed surface area , tolerance of this imaging performance becomes narrow, in addition,while scan doing reticle and photosensitive group sheet , when it does scanning light exposure method which exposes, tolerance of variation of imaging performance characteristic has become narrow,with dispersive correction cannot correspond.

[0006]

In addition, because vibration of projection optical system itself occurs in whenexchanging imaging performance corrected part material an above-mentioned way, there is also apossibility adverse effect occurring to imaging performance .

Then, this invention makes correction of continuous imaging performance possible withoutaccompanying vibration, it makes first objective .

In addition, this invention designates both achievements of thing whichincrease and imaging performance of number of openings of projection optical system correction is done as second objective .

[0007]

[Means to Solve the Problems]

In order to achieving above-mentioned first objective , with this invention as for aligner , with aligner which possesses projection optical system which forms theimage of illuminating optical system and this pattern which pattern which is provided on reticle illumination are done on photosensitive group sheet , inlight path between the projection optical system and photosensitive group sheet at

整・・・・・屈折率調整手段・有・・・・・・・

'0008'

・・・・上記請求項 2 ・掲・・好・・・態様・・・・・屈折率調整手段・・前記投影光学系・結像性能・補正・・・・・液体・屈折率・調整・・・・・・・・

・・構成・基・・・・請求項 3 ・掲・・好・・・態様・・・・・投影光学系・結像性能・測定・・結像性能測定手段・・・・備・・・・・・屈折率調整手段・・前記結像性能・補正・・・・・液体・屈折率・調整・・・・・・・・

'0009'

・・・請求項 4 ・掲・・好・・・態様・・・・・投影光学系・結像性能・変動・要因・状態・検知・・変動要因検知手段・・・・備・・・・・・・屈折率調整手段・・要因・状態・応・・・結像性能・補正・・・・・液体・屈折率・調整・・・・・・・・

・・構成・基・・・・請求項 5 ・掲・・好・・・態様・・・・・照明光学系・・前記・・・・対・・照明条件・変更可能・構成・・・変動要因検知手段・・照明条件・状態・検知・・屈折率調整手段・・照明条件・変更・応・・・結像性能・補正・・・・・液体・屈折率・調整・・・・・・・・

'0010'

・・・・請求項 6 ・掲・・好・・・態様・・・・・変動要因検知手段・・・・・・・種類・判別・・・・・・・・屈折率調整手段・・・・・・・種類・応・・・結像性能・補正・・・・・液体・屈折率・調整・・・・・・・・

・・・上述・第 2 ・目的・達成・・・・・・・投影光学系・感光性基板・・間・光路・全・・液体・満・・・・・好・・・・

・・・・・本発明・・・露光装置・・投影光学系・感光性基板・・間・光路・前記液体・満・・・・・・側壁・・液体・前記感光性基板・・

least through liquid which to position of portion is, exposes. It is something which possesses index of refraction adjustment means in order to adjust index of refraction of liquid.

[0008]

If according to desirable embodiment where here, it put out in theabove-mentioned Claim 2 , index of refraction adjustment means , in order the correction to do imaging performance of aforementioned projection optical system , is something whichadjusts index of refraction of liquid .

On basis of this configuration , if according to desirable embodiment whereit put out in Claim 3 , being something which furthermore has the imaging performance measuring means which measures imaging performance of projection optical system , index of refraction adjustment means , in order correction to do aforementioned imaging performance , is somethingwhich adjusts index of refraction of liquid .

[0009]

In addition, if according to desirable embodiment where it put out in Claim 4 , being something which furthermore has fluctuation factor detection means which detects state of factor of fluctuation of imaging performance of projection optical system , index of refraction adjustment means in order correction to do the imaging performance according to state of factor , is something which adjustsindex of refraction of liquid .

On basis of this configuration , if according to desirable embodiment whereit put out in Claim 5 , illuminating optical system configuration is done illumination condition for theaforementioned reticle in changeable , fluctuation factor detection means detects the state of illumination condition , index of refraction adjustment means in order correction to do imaging performance according to modification of illumination condition , issomething which adjusts index of refraction of liquid .

[0010]

If according to desirable embodiment where and, it put out in the Claim 6 , as for fluctuation factor detection means , being something whichdistinguishes types of reticle , as for index of refraction adjustment means , in order correction to do imaging performance according to types of reticle , it is something which adjusts index of refraction of liquid .

In addition, in order to achieve above-mentioned second objective , all of light path between projection optical system and photosensitive group sheet is filled up with the liquid , it is desirable .

This time, aligner as sidewall and liquid in order to fill up light path between projection optical system and photosensitive group sheet with aforementioned liquid are

・・・供給・・・共・前記感光性基板・・・・・回収・・・・・供給 回収・・・・・・備・・感光性基板・保持・・感光性基板・・・・・・・有・・・・・好・・・・

supplied to aforementioned photosensitive group sheet holder has supply &recovery unit in order to recover from aforementioned photosensitive group sheet holder with this invention , furthermore possesses photosensitive group sheet holder which keeps photosensitive group sheet , itis desirable .

0011・

[0011]

・・・屈折率調整手段・・液体・屈折率・調整・・・・・添加剤・供給・・添加剤供給・・・・・液体・・前記添加剤・回収・・・・・添加剤回収・・・・・・有・・・・・好・・・・

In addition, index of refraction adjustment means , aforementioned additive has additive recovery unit in order to recover from additive supply unit and liquid which supply additive in order to adjust index ofrefraction liquid , it is desirable .

0012・

[0012]

・発明・実施・形態・

[Embodiment of the Invention]

上述・構成・・・・本発明・・・・・・投影光学系・感光性基板・・間・光路中・位置・・液体・屈折率・調整・・・・・・・・・・・・・・屈折率・変化・・・投影光学系・結像性能・補正・・・・・・・・・

Regarding to above-mentioned configuration or other this invention, because you can adjust theindex of refraction of liquid which position in light path between projection optical system and photosensitive group sheet is, correction is possible imaging performance of the projection optical system with change of this index of refraction.

・・・・屈折率調整・手法・・・・・液体・多物質・混合液体・・・・・・・・・・混合液体・屈折率 n ・・・・・・・・・・・・・・・・(Lorentz-Lorenz)・式・従・・

When we assume, that here, liquid is mixed solution of multi substance as technique of index of refraction adjustment, as for index ofrefraction n of this mixed solution , in formula of Lorentz * Lawrence (Loren tz-Loren z) following,

0013・

[0013]

・数 1・

[Mathematical Formula 1]

$$\left(\frac{n^2-1}{n^2+2}\right)=\sum_{i=1,2,\ldots} m_{(i)} \times \left(\frac{n_{(i)}{}^2-1}{n_{(i)}{}^2+2}\right) \times \frac{\rho}{\rho_{(i)}}$$

0014・

[0014]

・・・・

With it becomes.

但・・

However,

0015・

[0015]

・数 2・

[Mathematical Formula 2]

$n_{(i)}$：i番目の物質の屈折率、

$m_{(i)}$：i番目の物質の重量分率、

$\rho_{(i)}$：i番目の物質の密度、

0016・

[0016]

・・・・

例・・液体・水溶液・・・・・・・水溶液・屈折率・水溶液自体・濃度・応・・変化・・・・・水溶液・添加・・物質・濃度・増減・・・・良・・

・・・・・・投影光学系・結像性能・補償・・・屈折率・値・・・・・・液体・屈折率・変化・・・・・投影光学系・結像性能・良好・・・・・・

0017・

・・・・屈折率・調整・・例・・投影光学系・収差・・・結像性能・測定・・・・結果・応・・屈折率・調整・・・良・・投影光学系・結像性能・変動・対応・・・・要因・変動・検知・・・・・結果・応・・屈折率・調整・・・良・・

前者・投影光学系・結像性能・測定・・手法・・・・・・露光装置・製造時・投影光学系・収差・・・測定・・・・収差・補償・・屈折率・値・液体・屈折率・初期値・設定・・・良・・

・・・・・製造時・調整・一部・・・屈折率・調整・・・・製造 調整・容易・・・利点・・・・

・・・露光装置自体・収差測定機構・・・設・・・・・・収差測定機構・・・収差測定結果・応・・・液体・屈折率・変更・・・良・・

0018・

一方・後者・結像性能・変動・対応・・要因・変動・・・・・・・・種類・照明条件・状態・投影光学系・通過・・露光工・・・・量・・・挙・・・・・

・・・・・・・・・照明・・際・照明条件(σ値・変形照明・否・・・)・・・・・・上・設・・・・・・・・種類・・・・最適・・・・決・・・・照明条件・変・・・・投影光学系・収差・初・・・・結像性能・変化・・・

・・・・例・・・・・・・種類・照明条件・・・要因・・・・・要因・変動・伴・・変化・・結像性能・補償・・・・・屈折率・値・予・・・・・・・・記憶・・・・・・・・要因・変

So it is.

When for example liquid is designated as aqueous solution , in order index ofrefraction of this aqueous solution to change according to density of the aqueous solution itself , if it increases and decreases density of substance which isadded to aqueous solution , it is good.

Because of this, in order to reach value of index of refractionwhich compensation it is possible imaging performance of projection optics , if index ofrefraction of liquid it changes, imaging performance of projection optical system becomessatisfactory ones.

[0017]

Here, adjustment of index of refraction measures aberration or other imaging performance of the for example projection optical system , is good adjusting index of refraction as a result according to,detecting fluctuation of factor which corresponds to thefluctuation of imaging performance of projection optical system , as a result according toadjusting index of refraction is good.

It measures aberration etc of projection optical system when producing aligner regarding technique which measures imaging performance of projection optical system of the former , it is good setting value of index of refraction which this aberration compensation is done to initial value of index of refraction of the liquid .

This way if index of refraction is adjusted as portion of adjustmentwhen producing, production * there is a benefit where adjustment becomeseasy.

In addition, it provides aberration instrument structure etc in aligner itself , it is goodmodifying index of refraction of liquid with this aberration instrument structure according to aberration measurement result .

[0018]

On one hand, you can list exposure dose etc which passes state , projection optical system of the types , illumination condition of reticle as fluctuation of factor which corresponds tofluctuation of imaging performance of the latter .

When here, illumination doing reticle , as for illumination condition (;si value, such as deformation illumination whether or not), when optimum ones are decided with types of pattern which is provided on the reticle , this illumination condition changes, imaging performance which begins aberration of the projection optical system changes.

Then, in every types , illumination condition or other factor of for example reticle , it is worthy of index ofrefraction in order compensation to do imaging performance which changes attendantupon fluctuation of this factor storage , detects

動・検知・・記憶・・・関係・基・・・液体・屈折率・調整・・・良・・

・・・投影光学系・通過・・露光エ・・・・量・大小・・・投影光学系・結像性能・変化・・・・・・照射変動・・・・・・・場合・・・・・露光エ・・・・量・・・・露光エ・・・・量・大小・・・・変化・・結像性能・補償・・・・・屈折率・値・予・・・・・・・・記憶・・・・・・・・要因・変動・検知・・記憶・・・関係・基・・・液体・屈折率・調整・・・良・・

・・・・・手法・・・・・・・・・記憶・・・代・・・・所定・計算式・算出・・・良・・

・0019・

・・・・・液体・屈折率・調整・・・・・投影光学系・結像性能・・・特・球面収差・像面湾曲・補正・効果的・・・・

以下・図面・参照・・・本発明・・・・実施・形態・・・・説明・・・

[第1・実施・形態]図1・・本発明・・・・第1・実施・形態・・・露光装置・概略的・示・図・・・・

尚・図1・・・・XYZ 座標系・採用・・・・・

・0020・

図1・・・・・光源S・・例・・波長248nm・露光光・供給・・・・光源 S ・・・露光光・・照明光学系 IL 及・反射鏡 M ・介・・・・・・R・・・均一・照度分布・・・・照明・・・

・・・・本例・・光源 S ・・・・KrF エ・・・・・光源・用・・・・・・・・代・・・・193nm・露光光・供給・・ArF エ ・・・光源・ g 線・i 線等・供給・・高圧水銀・・・等・用・・・良・・

・・・図1・・不図示・・・・・照明光学系 IL・・面光源・形成・・・・・・・・・・・・・・・・・・・・面光源・・・光・集光・・被照射面・重畳的・均一照明・・・・・・・・・・光学系・・・・・・・・・・・・・・・・・形成・・・面光源・位置・配置・・・面光源・形状・可変・・・・・・可変開口絞・・・有・・・・・・・・

fluctuationof this factor beforehand in memory and etc if it adjusts indexof refraction of liquid on basis of relationship which isremembered, it is good.

In addition, imaging performance of projection optical system changes with size of exposure dose which passes projection optical system , there is so-called lighting fluctuation, but inthis case putting, storage , detects fluctuation of this factor beforehand in exposure dose and it is worthy of index of refraction inorder compensation to do imaging performance which changes at size of this exposure dose memory etc, If index of refraction of liquid is adjusted on basis of therelationship which is remembered, it is good.

Furthermore, to memory it is good instead of storage doing,calculating with predetermined computational formula in this technique .

[0019]

This way, by fact that index of refraction of liquid isadjusted, among imaging performance of projection optical system , it is a effective in correction ofespecially spherical aberration , image plane curvature .

Below, referring to drawing , you explain concerning embodiment whichdepends on this invention .

[first embodiment] Figure 1 is figure which with first embodiment which depends on the this invention shows aligner in conceptual .

Furthermore with Figure 1 , XYZcoordinate system is adopted.

[0020]

In Figure 1 , light source S supplies exposure light of for example wavelength 248nm , exposure light from this light source S, through illuminating optical system IL and reflector M, almost illumination does reticle R in origin of uniform illumination distribution .

Here, with this example KrFexcimer laser light source is used as light source S,, but in place ofthat, making use of high pressure mercury lamp etc which supplies ArFexcimer laser light source and the g-line , i-line etc which supply exposure light of 193 nm it is good.

In addition, with Figure 1 it is a not shown in the diagram , but illuminating optical system IL light collection doing optical integrator in order to form planar light source , and light from this planar light source being arranged in location of planar light source which is formed by the capacitor optical system and optical integrator in order uniform illumination to do irradiated surface superimposition issomething which possesses variable aperture drawing in order to designate shape of planar light source as variable .

・・・・面光源・形状・・・・・光軸・・偏心・・複数・面光源・持・・・・輪帯形状・・・・円形状・・・・・・大・・・・・・・・・・・・・・

・・・・・照明光学系 IL ・・・・・例・・米国特許第 5,329,094 号公報・米国特許第 5,576,801 号公報・開示・・・・・・・・用・・・・・・・・

Here, as shape of planar light source , from optical axis eccentricity those whichhave planar light source of plural which is done. Those of wheel band shape . There are some etc where size differs in circular .

As this kind of illuminating optical system IL, those which are disclosed in for example U. S. Patent No. 5,329,094disclosure and the U. S. Patent No. 5,576,801disclosure can be used.

・0021・

・・・・・・・・・R ・通過 回折・・露光光・・投影光学系 T ・経・・エ・W 上・達・・・エ・上・・・・・・・R ・像・形成・・・・

[0021]

And, exposure light which reticle R passing *diffraction is done, passing by projection optical system T, reaches on wafer W, image of reticle R is formed on wafer .

・・・・・・・・・R・・・・・・・・・・・RL ・・・・保持・・・・・・・・・・・RL ・任意・時・・・・・・・・・・ LT 上・駆動装置 T1 ・・・・X 軸及・Y 軸上・任意・速度・移動・・・・・構成・・・・・・

Here, reticle R is kept with [rechikururoodaa] RL, [rechikururoodaa] RL is done inorder at time of option on [roodaateeburu] LT on "X" axis and the"Y" axis to be able to move with velocity of option due to the drive device T1, configuration .

・・・・・・・・・・・・RL ・・・・・・・・・ LT 上・・移動速度・・速度・・・-SS ・検知・・・・・速度・・・・SS ・・・出力・・第 1 制御部 CPU1 ・伝達・・・・

Here, mobility on [roodaateeburu] LT of [rechikururoodaa] RL is detected with the velocity sensor SS, output from this velocity sensor SS is transmitted to 1 st controller CPU 1.

・0022・

・・・・エ・W ・・・エ ・・・・WT ・・・保持・・・・・・

[0022]

In addition, wafer W is kept by wafer table WT.

・・・エ・・・・・WT ・・・液体 LQ ・溜・・・・・側壁・設・・・・・・・

reservoir * sidewall of for sake of has been provided liquid LQ in this wafer table WT.

本例・・・・・側壁・・・・・エ W ・・投影光学系 T ・・・光路・全・・液体 LQ ・満・・・・構成・・・・・・

With this example , it has become configuration where from wafer W all of light path to projection optical system T is filled up with liquid LQ by this sidewall .

・・・エ・・・・・WT ・・駆動装置 T2 ・・・・・・・・・・・HT 上・X 軸方向及・Y 軸方向・任意・速度・移動・・・・・・構成・・・・・・

This wafer table WT is done in order on holder table HT to be able to move to "X" axis direction and "Y" axis direction with velocity of option due to the drive device T2, configuration .

・0023・

・・・・上記・第 1 制御部 CPU1 ・・・・・・・・・・RL ・・・・・・・・・・ LT 上・・移動速度・・投影光学系 T ・露光倍率 β ・・・・エ・・・・・WT ・・・・・・・・・上・・移動速度・算出・・駆動装置 T2 ・伝達・・・

[0023]

Here, above-mentioned 1 st controller CPU 1, calculates mobility on holder table of wafer table WT from mobility on [roodaateeburu] LT of [rechikururoodaa] RL, and theexposure draw ratio ;be of projection optical system T transmits to drive device T2.

駆動装置・・第 1 制御部 CPU1 ・・伝達・・・移動速度・基・・・・・エ・・・・・WT ・移動・・・・

drive device moves wafer table WT on basis of mobility which wastransmitted from 1 st controller CPU 1.

・0024・

図 2 ・・・・・エ・・・・・WT ・構成・詳細・表・・図・・・・

[0024]

Figure 2 is figure which displays configuration of this wafer table WT indetail.

・・図 2・・・・・投影光学系 T・最・・エ・W 側・光学部材・・投影光学系 T ・金枠・・間・・液体 LQ ・浸透・・・・・・・・密着・・・・・・・・・・・・・・・・

In this Figure 2 , in order for liquid LQ not to permeate, it has stuckmost optical member of wafer W side of projection optical system T, or and between gold frame of projection optical system T, packing is done.

・・・・エ・・・・・ WT ・底部・・・複数・開口・設・・・・・・・・・・開口・接続・・・・配管 V・・減圧・・・・・・・・・エ・W・・エ・・・・・ WT ・吸着・・・・・・

In addition, aperture of plural is provided in base of the wafer table WT, wafer W is adsorbed into wafer table WT by vacuum doing from pipe V which is connected to these aperture .

・・・・・エ・・・・・ WT ・・・電極 D1,D2・設・・・・・・・・・・・電極 D1・D2・・・・・・周囲・・・・・・交換膜 I1,I2 ・設・・・・・・・

And, electrode D1,D2 is provided in wafer table WT, ion exchange membrane I1,I2 is provided in therespective periphery of these electrode D1, D2.

・・・・・・・交換膜 I1,I2 ・・・・電極 D1,D2・周囲・・露光光・液体 LQ ・通過・・領域・・区切・・・・

With these ion exchange membrane I1,I2, region where periphery and exposure light of electrode D1,D2 pass liquid LQ is divided.

・・・・電極 D1 ・周囲・雰囲気・・・・交換膜 I1 ・隔壁 K1 ・・・・密閉空間・・・・・・・・・密閉空間・・排気管 H1 ・接続・・・・・・

Here, atmosphere of periphery of electrode D1 has become sealed space depending upon with ion exchange membrane I1 and barrier K1, exhaust pipe H1 is connected tothis sealed space .

・・・電極 D2 ・周囲・雰囲気・・・・交換膜 I2 ・隔壁 K2 ・・・・密閉空間・・・・・・・・・密閉空間・・排気管 H2 ・接続・・・・・・

In addition, atmosphere of periphery of electrode D2 has become sealed space depending upon with ion exchange membrane I2 and barrier K2, exhaust pipe H2 is connected tothis sealed space .

・・・・排気管 H1・H2・・・・・混合器 K ・接続・・・・・・

These exhaust pipe H1, H2 are connected to mixer K together.

・・混合器 K・・・電磁弁 DV ・備・・導入管 LD ・一端・接続・・・・・・・・導入管 LD ・他端・・・エ・・・・・ WT ・近傍・位置・・・・・

one end of inlet tube LD which has electric solenoid DV is connected by this mixer K,as for other end of this inlet tube LD, is a position of vicinity of the wafer table WT.

・0025・

[0025]

電極 D1,D2 ・・印可電圧・図示・・電源供給部・・供給・・・電源供給部・供給・・印可電圧・・第 2 制御部 CPU2 ・・・制御・・・・

Illustration there is not a applied voltage to electrode D1,D2 from power supply sectionto be supplied, applied voltage which power supply section supplies iscontrolled by 2 nd controller CPU 2.

・・・電磁弁 DV ・開閉・関・・・・・第 2 制御部 CPU2 ・制御・・・

In addition, in regard to opening and closing electric solenoid DV, 2 nd controller CPU 2 control.

本例・・・・・・・電極 D1,D2・・・・交換膜 I1,I2 ・隔壁 K1,K2 ・排気管 H1,H2 ・混合器 K・電磁弁 DV ・導入管 LD ・図示・・電源供給部・第 2 制御部 CPU2 ・屈折率調整手段・構成・・・・・

With this example , these electrode D1,D2, ion exchange membrane I1,I2, barrier K1,K2, exhaust pipe H1,H2, mixer K, electric solenoid DV, inlet tube LD, illustrations are not power supply section, 2 nd controller CPU 2 configuration have done index of refraction adjustment means .

・0026・

[0026]

以下・屈折率調整手段・動作・・・・説明・・・

You explain below, concerning operation of index of refraction adjustment means .

以下・説明・・・・・液体 LQ ・・純水・添加剤・・・塩化水素・加・・・・・・・・・・・

At time of explaining below, liquid LQ have assumed that it issomething which adds hydrogen chloride to pure water as

・・

・・・液体 LQ ・屈折率・下・・場合・第 2 制御部 CPU2 ・・電源供給部・指令・送・・電極 D1 及・電極 D2 ・間・所定・電圧・所定・時間・・加印・・・

・・・・・陽極・・・電極・・・酸素気体・発生・・陰極・・・電極・・・水素・塩素・・混合気体・発生・・・

・・・・・液体 LQ ・・・・塩化水素濃度・下・・・・・上記(1)式・・・・・・・・・液体 LQ ・屈折率・低下・・・

・・・・各・・電極 D1,D2 ・近傍・発生・・気体・・・・・交換膜 I1;I2 ・通過・・・・・・排気管 H1,H2 ・介・・回収・・・・・可能・・・・

・・回収・・・気体・・混合器 K ・送・・・・

混合器 K ・・・回収・・・気体(酸素気体・水素気体・塩化水素気体)・混・合・・・・・・・・液体 LQ ・・・高濃度・添加物水溶液・生成・・・・

0027・

・・・液体 LQ ・屈折率・上・・場合・第 2 制御部 CPU2 ・・電磁弁 DV ・開・・高濃度・添加物水溶液・液体 LQ ・加・・・・・・電磁弁 DV ・指令・送・・

・・・・・・液体 LQ ・屈折率・上昇・・・

・・構成・・・・液体 LQ ・屈折率・可変・・・・・

・・・第 2 制御部 CPU2 ・接続・・・・・・・・・M1 ・・・種・・照明条件・・・対応・・屈折率・値・・・・・・形・記憶・・・・・・

・・・・屈折率・値・・・・照明条件下・・・・投影光学系 T ・生・・収差・補正・・・・・必要・液体 LQ ・屈折率・値・・・・

・・・・・・・・・M1 ・・・・・時点・・・・液体 LQ 中・添加物濃度・値・・常・更新・・・形・保管・・・・・・

0028・

・・・上記・照明光学系 IL ・・・・照明光学系 IL ・形成・・面光源・形状・関・・情報・第 2 制御部 CPU2 ・伝達・・・・・・第 2 制御部 CPU2 ・接続・・・・・・

additive .

First, when index of refraction of liquid LQ is reduced, 2 nd controller CPU 2 sendorder to power supply section, just predetermined time adding sign does predetermined voltage between electrode D1 and electrode D2.

This time, oxygen vapor occurs from electrode which becomes the anode , mixed gas of hydrogen and chlorine occurs from electrode which becomes cathode .

This time, because hydrogen chloride density in liquid LQ goes down, as understoodeven from above-mentioned Formula (1), index of refraction of the liquid LQ decreases.

Here, as for vapor which occurs with vicinity of each electrode D1,D2,because ion exchange membrane I1,I2 is not passed, through exhaust pipe H1,H2, recovers ispossible .

This vapor which recovers is sent to mixer K.

With mixer K, it can mix vapor (oxygen vapor, hydrogen vapor and hydrogen chloride vapor) which recovers, additive aqueous solution of high concentration is formed from this, in comparison with liquid LQ.

[0027]

In addition, when index of refraction of liquid LQ is increased, 2 nd controller CPU 2, opening electric solenoid DV, in order to add additive aqueous solution of high concentration to liquid LQ, send order to electric solenoid DV.

Because of this, index of refraction of liquid LQ rises.

With this configuration , index of refraction of liquid LQ can be designated as variable .

Well, in memory M1 which is connected to 2 nd controller CPU 2, corresponding every various illumination condition , value of index of refraction is remembered in form of the table .

Here, value of index of refraction is value of index of refraction of liquid LQ which is necessary in order correction to do aberration whichit occurs with projection optical system T in under a certain illumination condition .

In addition, in this memory M1, value of additive density in liquid LQ in acertain time point , is kept in form which always is renewed.

[0028]

In addition, above-mentioned illuminating optical system IL, 2 nd controller CPU 2 is connected in orderto transmit information regarding shape of planar light source which this illuminating optical system IL forms to 2 nd controller CPU 2.

・・・・照明条件-本例・・面光源・形状-・変化・・・・・情報・第２制御部 CPU2 ・伝達・・・・

・・・・・第２制御部 CPU2 ・・伝達・・・照明条件・対応・・屈折率・値・・・・・M1 ・・検索・・・・屈折率・実現・・・・・添加物・濃度・上記(1)式・・計算・・・

次・第２制御部 CPU2 ・・・・・・M1 ・保管・・・・・現在・添加物濃度・・計算・・・添加物濃度・・従・・・現在・添加物濃度・計算・・・添加物濃度・・・・・・・電極 D1,D2 ・・・・電磁弁 DV ・制御・・・

・0029・

・・・・・・液体 LQ ・屈折率・値・・液体 LQ ・含・・・・・投影光学系 T ・収差・補正・・・・・・・・

[第２・実施・形態]第２・実施・形態・・第１・実施・形態・・・・添加物・エ・・・・・・・・点・大・・異・・・

・・エ・・・・・・・・・感光性基板・・・・・・・・塗布・・・・エ・ W ・・・・・層・溶解・・・投影光学系 T ・・・・最・・エ・W 側・光学部材(液体 LQ ・接・・光学部材)及・・・光学部材・施・・・光学・・・・・影響・少・・利点・・・・

・0030・

・・・第２・実施・形態・・・・・・屈折率調整手段・構成・第１・実施・形態・・・・・異・・・

以下・図３・参照・・屈折率調整手段・構成・・・説明・・・

・・・図３・・・・・図２・示・・・・・同・機能・有・・部材・・・同・符号・付・・・・・

第２・実施・形態・・・・エ・・・・・WT ・示・図３・・・・・第１・実施・形態・・・・・異・・点・・添加物・液体 LQ ・供給・・・・・添加物供給管 LS ・・純水・液体 LQ ・供給・・・・・純水供給管 WS ・・液体 LQ ・・エ・・・・・ WT ・・溢・・・・・・液体 LQ ・排出・・排出管 L ・・有・・点・・・・

・0031・

・・・・添加物供給管 LS ・純水供給管 WS 及・排出管 L ・・・添加物及・純水・供給量・調

2.

When here, with illumination condition -this example shape - of planar light source changes, this information is transmitted to 2 nd controller CPU 2.

This time, 2 nd controller CPU 2 search value of index of refraction whichcorresponds to illumination condition which was transmitted from memory M1,calculate density of additive in order to actualize that index ofrefraction from above-mentioned Formula (1).

Next 2 nd controller CPU 2 present additive density and additive density which were calculatedfollowing, in order to make additive density which present additive density wascalculated, with to electrode D1,D2 which are kept in memory M1 or control electric solenoid DV.

[0029]

Because of this, as for value of index of refraction of liquid LQ,when including liquid LQ, aberration of projection optical system T becomes somethingwhich correction is done.

As for [second embodiment] second embodiment , point which designates additive in first embodiment as ethyl alcohol differs largely.

As for this ethyl alcohol , resist as photosensitive group sheet does not melt resist layer of wafer W which application is done, in projection optical system T most optical member of wafer W side (optical member which touches with liquid LQ) and there is a benefit whose influence to optics coating whichis administered to this optical member is little.

[0030]

In addition, configuration of index of refraction adjustment means differs fromthose of first embodiment regarding second embodiment .

Below, referring to Figure 3 , you explain concerning configuration of theindex of refraction adjustment means .

Furthermore, as those which are shown in Figure 2 in Figure 3 , in member which possesses same function is attached same code .

Those of first embodiment as for point which differs, in order for the additive supply pipe LS in order to supply additive to liquid LQ and pure water feed pipe line WS and the liquid LQ in order to supply pure water to liquid LQ not to overflow from wafer table WT, it is a point which possesses discharge tube L which discharges liquid LQ in Figure 3 showing wafer table WT with second embodiment .

[0031]

Here, electric solenoid DVLS,DVWS in order to adjust supply amount of additive and the pure water and electric

整・・・・・電磁弁 DVLS,DVWS 及・液体 LQ ・排出量・調整・・・・・電磁弁 DVL ・・・・・設・・・・・・・・・・・電磁弁 DVLS,DVWS,DVL ・開閉・・第 2 制御部 CPU2 ・・・制御・・・・・・

第 2 ・実施・形態・・・・屈折率調整時・動作・・・・説明・・・・

0032・

・・・液体 LQ ・屈折率・上・・場合・第 2 制御部 CPU2 ・電磁弁 DVLS ・制御・・・所定・量・・添加物・液体 LQ ・加・・・

・・・・・排出管 L ・・液体 LQ ・所定・量・・排出・・・

・・排出・・液体 LQ ・量・・加・・・・添加物・量・同・・・・・・・好・・・・

・・・・・・液体 LQ 中・添加物濃度・高・・・・屈折率・上昇・・・

0033・

・・・液体 LQ ・屈折率・下・・場合・第 2 制御部 CPU2 ・電磁弁 DVWS ・制御・・・所定・量・・純水・液体 LQ ・加・・・

・・・・・排出管 L ・・液体 LQ ・所定・量・・排出・・・

・・排出・・液体 LQ ・量・・加・・・・純水・量・同・・・・・・・好・・・・

・・・・・・液体 LQ 中・添加物濃度・低・・・・・屈折率・低下・・・

0034・

・・・・加・・・・添加物及・純水・量・排出・・液体 LQ ・量・・第 2 制御部 CPU2 ・・・制御・・・・

・・・・・・・M1 内・照明条件・種類・対応・・屈折率・値・記憶・・・点・・・時点・・・・液体 LQ ・添加物濃度・値・保管・・・点・・上述・第 1 ・実施・形態・同様・・・・・・・情報・基・・・・投影光学系 T ・収差・補正・・・屈折率・実現・・・・・添加物濃度・計算・・点・第 1 ・実施・形態・同様・・・・

0035・

・・・・・・・・第 2 ・実施・形態・・・・第 2 制御部 CPU2 ・・・・・M1 ・保管・・・・・現在・添加物濃度・・計算・・・添加物濃度・

solenoid DVL in order to adjust effluent amount of liquid LQ arerespectively provided in additive supply pipe LS, pure water feed pipe line WS and discharge tube L, opening and closingthese electric solenoid DVLS,DVWS,DVL is controlled by 2 nd controller CPU 2.

You explain concerning operation at time of index ofrefraction adjustment in second embodiment .

[0032]

First, when index of refraction of liquid LQ is increased, 2 nd controller CPU 2 controlling electric solenoid DVLS, just predetermined amount add additive to liquid LQ.

This time, just predetermined amount discharges liquid LQ from discharge tube L.

This as for quantity of liquid LQ which is discharged, it is thesame as quantity of additive which is added, it is desirable.

Because of this, additive density in liquid LQ increases, index ofrefraction rises.

[0033]

In addition, when index of refraction of liquid LQ is reduced, 2 nd controller CPU 2 controlling electric solenoid DVWS, just predetermined amount add pure water to liquid LQ.

This time, just predetermined amount discharges liquid LQ from discharge tube L.

This as for quantity of liquid LQ which is discharged, it is thesame as quantity of pure water which is added, it is desirable.

Because of this, additive density in liquid LQ becomes low, index ofrefraction decreases.

[0034]

Here, quantity of additive and pure water which are added and thequantity of liquid LQ which is discharged are controlled by 2 nd controller CPU 2.

Furthermore, corresponding to types of illumination condition inside memory M1,as for point where value of additive density of liquid LQ in pointand a certain time point where value of index of refraction is rememberedis kept, being similar to above-mentioned first embodiment , on basis ofthese information , Also point which calculates additive density in order to actualize theindex of refraction which correction it is possible aberration of the projection optical system T is similar to first embodiment .

[0035]

This way, 2 nd controller CPU 2 in second embodiment following with to present additive density which is kept in memory M1 and additive density which was calculated,

・従・・・現在・添加物濃度・計算・・・添加物濃度・・・・・・・電磁弁 DVLS,DVWS,DVL・開閉・制御・・・

・・・・・・液体 LQ・屈折率・値・・液体 LQ・含・・・・・投影光学系 T・収差・補正・・・・・・・

[第 3・実施・形態]次・・図 4・参照・・第 3・実施・形態・・・・説明・・・

第 3・実施・形態・・・露光装置・・収差測定装置・備・・・・点・上述・第 1 及・第 2・実施・形態・・異・・・

・・・図 4・・・・・上述・図 1~図 3・例・同・機能・有・・部材・・同・符号・付・・・・図 1・同様・XYZ 座標系・採用・・・・・

0036・

図 4・・・・・光源 S・・波長 248nm・露光光・供給・・・・光源 S・・・露光光・・・・・整形光学系 11・・・所定形状・断面・整・・・・後・第 1・・・・・・・・・12・入射・・・

第 1・・・・・・・・・12・射出側・・・複数・光源像・・・・2 次光源・形成・・・・

・・2 次光源・・・露光光・・・・・・・・系 13F,13R・経・第 2・・・・・・・・・15・入射・・・

・・・・・・・・・系・前群 13F 及・後群 13R・・構成・・・・・・・前群 13F 及・後群 13R・間・・・被照射面上・・・・・・・・・防止・・・・・振動・・・14・配置・・・・・・

0037・

・・・第 2・・・・・・・・・15・射出面側・・・第 1・・・・・・・・・・・・2 次光源・像・複数形成・・・・・・3 次光源・・・・

・・3 次光源・形成・・・位置・・・所定・形状・・・・所定・大・・・持・複数・開口絞・・設定・・・可変開口絞・16・配置・・・・・・

・・可変開口絞・16・・例・・図 5・示・・・・・石英・・・構成・・・透明基板上・・・・・・・・・・6・・開口絞・16a~16e・・・・・・状・設・・・・・・・・

・・・・円形開口・持・2・・開口絞・16a,16b・・σ値(投影光学系・開口数・対・・照明光学系・開口数)・変更・・・・・絞・・・・・輪

inorder to make additive density which present additive density was calculated,control opening and closing electric solenoid DVLS,DVWS,DVL.

Because of this, as for value of index of refraction of liquid LQ,when including liquid LQ, aberration of projection optical system T becomes somethingwhich correction is done.

[embodiment of 3 rd] Next, referring to Figure 4 , you explain concerning embodiment of 3 rd .

In embodiment of 3 rd aligner differs from above-mentioned 1 st and 2nd embodiment in point which has aberration measuring apparatus .

Furthermore, as example of above-mentioned Figure 1 ~Figure 3 same code on member which possesses same function it is attached in Figure 4 , XYZcoordinate system which is similar to Figure 1 is adopted.

[0036]

In Figure 4 , light source S supplies exposure light of wavelength 248nm , exposure light from this light source S, after being arranged in cross section of specified shape by the beam fairing optical system 11, incidence does in 1 st fly eye lens 12.

secondary light source which consists of light source image of plural is formed on injection side of 1 st fly eye lens 12.

Passing by relay lens 13 F,13R, incidence it does exposure light from this secondary light source , to 2 nd fly eye lens 15.

This relay lens system configuration is done from front group 13 F andrear group 13 R, vibrating mirror 14 in order to prevent the speckle on irradiated surface is arranged in group 13 F before these andbetween rear group 13 R.

[0037]

Well, in emitting plane side of 2 nd fly eye lens 15, image of secondary light source plural form isformed with 1 st fly eye lens , this becomes 3 rd light source .

variable aperture drawing 16 which can set aperture drawing of plural which has predetermined shape or predetermined size is arranged in location where these 3 rd light source are formed.

This variable aperture drawing 16, as shown in for example Figure 5 , is something which provides 6 aperture drawing 16a~16e which patterning are done in turret condition on transparent substrate which the configuration is done with such as quartz .

Here, as for 2 aperture drawing 16a,16b which have round aperture , with drawing in order tomodify the;si value (number of openings of illuminating optical system for

帯形状・持・2・・開口絞・16c,16d・・互・・輪帯比・異・・絞・・・・・・

・・・・残・・2・・開口絞・16e,16f・・4・・偏心・・開口・有・・絞・・・・・

・・可変開口絞・16・・可変開口絞・駆動・・・・17・・・・複数・開口絞・16a~16f・・・何・・一・・光路内・位置・・・・・駆動・・・・

[0038]

図4・戻・・・可変開口絞・16・・・・露光光・・・・・・・・・・系18・・・集光・・・・・・・・・・・19上・重畳的・照明・・・

・・・・・・・・・19・・・・・光学系20F,20R・関・・・・・・R・・・・・形成面・共役・配置・・・・・・・・・・・・・・・19・開口形状・・・・・・・R上・・照明領域・形状・決定・・・・

・・・・・・・・・19・・・露光光・・・・・光学系・前群20F・反射鏡M及・・・・光学系・後群20R・介・・・・・・R上・所定・位置・実質的・均一・照度分布・照明領域・形成・・・

[0039]

・・・前述・第1及・第2・実施・形態・・・・照明光学系IL・・・・実施・形態・示・・・・整形光学系11~・・・光学系20F,20R・適用・・・・・・・・

・・・・・・・R・・・・・・・・・-RL上・載置・・・・・・・・・・・・・・・-RL・・・・・・・・・LT上・図中XY方向及・Z軸・中心・・・回転方向(θ方向)・移動可能・・・・・・

・・・・・・・・・-RL・・・移動鏡RIM・設・・・・・・・・・・・干渉計RI・・・・・・・・・-RL・XY方向及・θ方向・位置・検出・・・

・・・・・・・・・・-RL・・・・・・・・・・-駆動・・・・RLD・・・XY方向及・θ方向・駆動・・・・

・・・・・・・・干渉計RI・・・出力・・第1制御部CPU1・伝達・・・第1制御部CPU1・・・・・・・・・・-駆動・・・・RLD・制御・・構成・・・・・・・

[0040]

number of openings of projection optical system), as for 2 aperture drawing 16c,16d which have wheel band shape , it is a drawing where wheel band ratio differs mutually.

And, remaining 2 aperture drawing 16e,16f eccentricity of 4 are drawing whichpossesses aperture which is done.

This variable aperture drawing 16 is driven in order for inside any one of aperture drawing 16a~16f of the plural to be a position inside light path depending upon variable aperture drawing drive unit 17.

[0038]

Returning to Figure 4 , exposure light from variable aperture drawing 16 light collection being doneby condenser lens system 18 illumination does on reticle blind 19 superimposition .

reticle blind 19 is arranged in pattern formation surface and conjugation of reticle R inregard to relay optical system 20F,20R, shape of illumination region on reticle R is decided by open shape of reticle blind 19.

exposure light from reticle blind 19, through front group 20 F, reflector M of the relay optical system and rear group 20 R of relay optical system , forms illumination region of the uniform illumination distribution substantially in specified position on reticle R.

[0039]

Furthermore, illuminating optical system IL in aforementioned 1 st and 2nd embodiment can also apply beam fairing optical system 11~relay optical system 20F,20R which is shown in this embodiment .

Well, reticle R is mounted on reticle loader -RL, this reticle loader -RL on holder table LT hasbecome movable in in the diagram XY direction and rotational direction (;th direction) which designates Z-axis as center .

Portable mirror RIM is provided in this reticle loader -RL, reticle interferometer RI detects the position of XY direction and;th direction of reticle loader -RL.

In addition, reticle loader -RL is driven to XY direction and;th directionby reticle loader -drive unit RLD.

Here, output from reticle interferometer RI is transmitted to 1 st controller CPU 1, 1 st controller CPU 1 hasbecome configuration which controls reticle loader -drive unit RLD.

[0040]

・・・図示・・・・・・・・・・・・・・・搬送路・途中・・・・・・・R・設・・・・・・・・・読・・・・・・・・・・・・・・・BR・設・・・・・・・

・・・・・・・・・・・BR・読・・・・・・・R・種類・関・・情報・・第2制御部CPU2・伝達・・・・

・・・・第2制御部CPU2・接続・・・・・・・・M1・・・・・・・R・種類・・・最適・照明条件・関・・情報・・・・・・R・種類・・・最適・液体LQ・屈折率・値・・記憶・・・・・・

[0041]

・・・・R・下側・・・所定・縮小倍率|β|・有・・投影光学系T・設・・・・・・・・・投影光学系T・最・・エ・面側・光学部材・・エ・W・・間・・・液体LQ・介在・・・・・

投影光学系T・・・・液体LQ・介・・・エ・面上・・・・・R・縮小像・形成・・・

・エ W・・・エ・・・・・WT・吸着固定・・・・・・・・・エ・・・・・WT・・・エ・・・・・WT自体・Z軸方向・・移動・・・・・(Z軸・対・・傾・)・行・・・・・・Z・・・・エ・・ZD1,ZD2,ZD3・介・・・定盤・対・・XY方向・移動可能・・エ・・・・・WTS・取・付・・・・・・・

・・・エ ・・・・WTS・・・エ ・・・・駆動・・・・WD・・・駆動・・・・

・・・・エ・・・・・・側壁・鏡面加工・施・・・・・・・・部分・・エ・干渉計WI・移動鏡・・・・・・・

・・・・・エ・・・・・駆動・・・・WD・駆動・上述・第1制御部CPU1・制御・・・・エ・干渉計WI・・・出力・第1制御部CPU1・伝達・・・構成・・・・・・・

[0042]

・・・投影光学系T・・・投影光学系T・・エ・W・・間・Z方向・距離・測定・・・・・・・・・・・・AF・設・・・・・・・

・・・・・・・・・・・AF・・投影光学系T・・・・・エ・W側・近・光学素子・介・・・エ・面上・光・照射・・・・・・エ・・反射・・・光・上記光学素子・介・・受光・・・・受光位置・・・投影光学系T・・エ・W・・間・Z方向・距離・測定・・・・・・・・

In addition, illustration it is not on middle of feeding passage from reticle stocker , barcode reader BR in order to grasp barcode which is provided in reticle R is provided.

information regarding types of reticle R which this barcode reader BR grasps istransmitted to 2 nd controller CPU 2.

Here, in memory M1 which is connected to 2 nd controller CPU 2, value of index ofrefraction of optimum liquid LQ is remembered in every types of information and reticle R regarding optimum illumination condition in every types of reticle R.

[0041]

projection optical system T which possesses predetermined reduction draw ratio |;be | is providedin underside of reticle R, liquid LQ has lain between most in the optical member of wafer surface side of this projection optical system T and between wafer W.

projection optical system T, through this liquid LQ, forms reduced image of reticle R on the wafer surface .

wafer W adsorptive immobilization is done in wafer table WT, this wafer table WT through Zactuator ZD1,ZD2,ZD3 in order it moves to Z-axis direction of wafer table WTitself and (slope for Z-axis) tilt , in XY direction is installed in movable wafer stage WTS vis-a-vis fixed base .

This wafer stage WTS is driven by wafer stage drive unit WD.

In addition, as for sidewall of wafer table mirror surfacing is administered,this portion has become portable mirror of wafer interferometer WI.

Here, drive of wafer stage drive unit WD is controlled with above-mentioned 1 st controller CPU 1, output from wafer interferometer WI has become configuration which istransmitted to 1 st controller CPU 1.

[0042]

In addition, focus sensor AF in order to measure distance of Z direction between projection optical system T and wafer W is provided in projection optical system T.

As for this focus sensor AF, through optical element which is close to wafer W sidein projection optical system T light is irradiated on wafer surface , light which at thesame time is reflected with wafer is done through theabove-mentioned optical element , incident light , it is something which distance of Z direction between projection optical system T and wafer W is measured due to the light receiving position

・・・・・・・・・・・・・・ AF ・構成・ ・例・・特開平 6-66543 号公報・開示・・・・・・

and wafer W is measured due to the light-receiving position .

configuration of this kind of focus sensor AF is disclosed in for example Japan Unexamined Patent Publication Hei 6-66543disclosure .

・0043・

[0043]

・・・第 3 ・実施・形態・・・・・・添加物保管部 LST ・貯蔵・・・高濃度・添加物水溶液・液体 LQ ・供給・・・・・添加物供給管 LS ・・純水保管部 WST ・貯蔵・・・純水・液体 LQ ・供給・・・・・純水供給管 WS ・・備・・・・・添加物供給管 LS 及・純水供給管 WS ・・・添加物水溶液及・純水・供給量・調整・・・・・電磁弁 DVLS,DVWS ・設・・・・・・

Well, regarding embodiment of 3 rd , we to have pure water feed pipe line WS in order tosupply additive supply pipe LS in order to supply additive aqueous solution of high concentration which isstored in additive preservation tube part LST to liquid LQ and pure water which is stored in pure water preservation tube part WST to liquid LQ, in the additive supply pipe LS and pure water feed pipe line WS, electric solenoid DVLS,DVWS in order to adjust supply amount of additive aqueous solution and pure water isprovided.

・・・・エ・・・・・ WT ・・・液体LQ ・・エ・・・・・・・溢・・・・・・液体 LQ ・排出・・・・・排出管 L ・設・・・・・・・・・排出管L ・・ ・液体LQ ・排出量・調整・・・・・電磁弁・設・・・・・・・

In addition, in order for liquid LQ not to overflow from wafer table ,discharge tube L in order to discharge liquid LQ is provided in wafer table WT,electric solenoid in order to adjust effluent amount of liquid LQ is provided inthis discharge tube L.

・・・・電磁弁 DVLS,DVWS,DVL ・開閉・・上述・第2・実施・形態・同様・・第2制御部 CPU2 ・・・制御・・・・・・

Opening and closing these electric solenoid DVLS,DVWS,DVL in same way as above-mentioned second embodiment , is controlled by 2 nd controller CPU 2.

・0044・

[0044]

・・・・エ・・・・・ WT 上・・・投影光学系・収差・測定・・・・・収差測定部 AS ・・液体 LQ ・添加物濃度・検出・・・・・添加物濃度検出部 DS ・・設・・・・・・

In addition, aberration measurement part AS in order to measure aberration of projection optical system and additive concentration detection section DS in order to detect additive density of liquid LQ areprovided on wafer table WT.

・・・・収差測定部 AS ・・・・・例・・特開平 6-84757 号公報・開示・・・・・・・・用・・・・・・・・

Here, those which are disclosed in for example Japan Unexamined Patent Publication Hei 6-84757disclosure as aberration measurement part AS, can beused.

・・・・収差測定部 AS 及・添加物濃度検出部 DS ・・・出力・・第 2 制御部 CPU2 ・伝達・・・・

Here, output from aberration measurement part AS and additive concentration detection section DS istransmitted to 2 nd controller CPU 2.

・・・添加物濃度検出部 DS ・・・出力・・第 2 制御部 CPU2 ・介・・・・・・M1 ・・・時点・・・・液体 LQ ・添加物濃度・値・・・保管・・・・

In addition, as for output from additive concentration detection section DS, through 2 nd controller CPU 2, to memory M1 it is kept as value of additive density of liquid LQ in time point which is.

・0045・

[0045]

次・・第 3 ・実施・形態・動作・・・・説明・・・

Next, you explain concerning operation of embodiment of 3 rd .

・・・図示・・・・・・・・・・・・・・・・・R・取・出・・・・・・・・・・-RL 上・載置・・途中・・・・・・・・・・・BR ・・・・・・R・設・・・・・・・・・・・・読・取・・・・情報・第 2 制御部 CPU2 ・伝達・・・

First, illustration there is not a reticle R being removed from reticle stocker ,on middle which is mounted on reticle loader -RL, barcode reader BR barcode whichis provided in reticle R transmits information of reading , to 2 nd controller CPU 2.

第 2 制御部 CPU2 ・・・・・・M1 ・記憶・・・・・・・・・R ・種類・対応・・照明条件・関・・情報・読・出・・・・情報・従・・・可変開口絞・駆動・・・・ 17 ・制御・・開口絞・16a~16f ・・・・所定・一・・光路内・位置・・・・

・・・第 2 制御部 CPU2 ・・・・・・・M1 ・記憶・・・・・・液体 LQ ・屈折率・値・基・・・・・・屈折率・実現・・・・・・添加物・濃度・上記(1)式・・計算・・・

・・後・添加物濃度検出部 DS ・・・検出・・・・・・・・M1 ・保管・・・・・現在・添加物濃度・・計算・・・添加物濃度・・従・・・現在・添加物濃度・計算・・・添加物濃度・・・・・・・電磁弁 DVLS,DVWS,DVL ・開閉・制御・・・

0046

・・・・・・液体 LQ ・屈折率・値・・液体 LQ ・含・・・・・投影光学系 T ・収差・補正・・・・・・・・

・・後・・・・・・・・・・ AF ・・・・エ・ W ・Z 方向・位置及・・・・・・検出・・・・エ・W ・所要・位置・・・・・・ Z ・・・・エ・・ZD1,ZD2,ZD3 ・駆動・・・

・・状態・・・・・光源 S ・・・露光光・照明光学系・介・・・・・・ R ・導・・第 1 制御部 CPU1 ・・・・・・干渉計 RI 及・・エ 干渉計 WI ・・・・・・・R 及・・エ・ W ・位置・検出・・・・・・・・・・・-駆動・・・・RLD 及・・エ ・・・・駆動・・・・WD ・駆動・・・・・・・・R 及・・エ・ W ・投影光学系 T ・投影倍率|β|・速度比・元・移動・・・・

・・・・・・・・・・ R 上・・・・・・・良好・結像状態・・・・・エ・ W 上・転写・・・・

0047

・・・投影光学系 T ・結像性能(収差・・)・・常・一定・・・・・温度変化・大気圧変化・投影光学系 T ・露光光・吸収・・・・・・・温度上昇・・・・・変化・・場合・・・・

・・・・第 3 ・実施・形態・・・収差測定部 AS・・・実際・投影光学系 T ・収差(結像性能)・測定・・・・測定結果・基・・・液体 LQ ・屈折率・値・調整・・構成・・・・・・

0048

Following information regarding illumination condition which corresponds to types of reticle R which is remembered in memory M1 to information of the reading , , controlling variable aperture drawing drive unit 17, predetermined one among aperture drawing 16a~16f location itdoes 2 nd controller CPU 2, inside light path .

In addition, 2 nd controller CPU 2 calculate density of additive in order toactualize that index of refraction on basis of value of indexof refraction of liquid LQ which is remembered in memory M1, from theabove-mentioned Formula (1).

After that, being detected by additive concentration detection section DS, following withto present additive density which is kept in memory M1 and additive density whichwas calculated, in order to make additive density which present additive density wascalculated, it controls opening and closing electric solenoid DVLS,DVWS,DVL.

[0046]

Because of this, as for value of index of refraction of liquid LQ,when including liquid LQ, aberration of projection optical system T becomes somethingwhich correction is done.

Detecting location and tilt of Z direction of wafer W after this, with focus sensor AF, in order for wafer W to become thenecessary location , it drives Zactuator ZD1,ZD2,ZD3.

In this state , through illuminating optical system , it leads exposure light from light source S to reticle R, while detecting location of reticle R and wafer W with reticle interferometer RI and wafer interferometer WI, driving reticle loader -drive unit RLD and wafer stage drive unit WD, reticle R and wafer W it moves 1 st controller CPU 1, in origin of speed ratio of projection draw ratio |;be| of projection optical system T.

Because of this, pattern on reticle R is copied to on wafer W inorigin of satisfactory imaging state .

[0047]

Well, imaging performance (Such as aberration) of projection optical system T is not fixed always, temperature change and atmospheric pressure change and there are times when it changes temperature rise etc with byfact that projection optical system T absorbs exposure light .

Then, it has made configuration which with embodiment of 3 rd , measures aberration (imaging performance) of actual projection optical system T due to aberration measurement part AS, adjusts value of indexof refraction of liquid LQ on basis of this measurement result .

[0048]

具体的・・・第 3 ・実施・形態・・・・・・M1 内・投影光学系・収差値・対応・・・形・・・・収差・補正・・・液体 LQ ・屈折率・値・記憶・・・・・・

・・・・収差測定部 AS ・・・検出・・・投影光学系 T ・収差・・第 2 制御部 CPU2 ・伝達・・・・

第 2 制御部 CPU2 ・・・・・・M1 内・記憶・・・・・液体 LQ ・屈折率・値・読・出・・・・屈折率・値・・・・・・添加物濃度・上記(1)式・・求・・液体 LQ ・・・添加物濃度・・・・・・電磁弁 DVLS,DVWS,DVL ・開閉・制御・・・

0049・

・・構成・・・・投影光学系 T ・環境変化(温度変化・大気圧変動・露光光吸収・・・変動)・・・・・・・結像性能・良好・維持・・・・・・・・・

・・・・・収差測定部 AS ・・・測定・・常時行・必要・・・・所定・周期・・・行・・良・・

[第 4 ・実施・形態]次・図 6 ・参照・・・第 4 ・実施・形態・・・・説明・・・

第 4 ・実施・形態・・投影光学系・・エ・・・間・光路・全・・液体・満・・構成・・・・・・光路・一部・液体・満・・構成・・・・・・・・・

0050・

図 6(a), (b)・・・・・図 1~3 ・示・・第1 及・第2 ・実施・形態・同・機能・有・・部材・・同・符号・伏・・・・・

図 6(a), (b)・示・第 4 ・実施・形態・・・・エ・・・・・-WT ・側壁・・・液体 LQ ・溜・・代・・・・露光光・透過・・・材料(例・・石英・・)・構成・・・容器 C1,C2 中・液体 LQ ・満・・構成・前述・第 1 及・第 2 ・実施・形態・・異・・・

・・構成・・・・前述・第 1 及・第 2 ・実施・形態・有・・・・効果・・・・開口数増大・・・実効的焦点深度拡大・効果・・・・・・・連続的・投影光学系 T ・収差(結像性能)調整・可能・・・効果・有・・・・・

0051・

Concrete, with embodiment of 3 rd , in form which corresponds to aberration value of projection optical system inside memory M1, value of index ofrefraction of liquid LQ which correction , it is possible aberration isremembered.

aberration of projection optical system T which is detected and, by aberration measurement part AS istransmitted to 2 nd controller CPU 2.

In order value of index of refraction of liquid LQ which is rememberedinside memory M1 to reach value of this index of refraction of the reading , , additive density above-mentioned Formula (1) from it seeks 2 nd controller CPU 2,in order for liquid LQ to become additive density , it controls opening andclosing electric solenoid DVLS,DVWS,DVL.

[0049]

Depending upon this configuration , there being a environmental change (It fluctuates with temperature change , atmospheric pressure fluctuation and exposure light absorption) of projection optics T, it canmaintain imaging performance satisfactorily.

Furthermore, measures with this aberration measurement part AS and does not have necessityusual to do in every predetermined cycle , it is good.

[embodiment of 4 th] Referring to Figure 6 next, you explain concerning embodiment of 4 th .

embodiment of 4 th is not configuration which fills up all of the light path between projection optical system and wafer with liquid , is somethingwhich is made configuration which satisfies portion of this light path with liquid .

[0050]

Figure 6 (a), in (b), as 1 st and 2nd embodiment which is shown in Figure 1 ~3 thesame code to member which possesses same function *.

Figure 6 (a), in embodiment of 4 th which are shown in (b), the liquid LQ reservoir * in substituting, configuration which fills up liquid LQ in canister C1,C2 which configuration is done differs from aforementioned 1 st and 2nd embodiment in material (Such as for example quartz) which transmits exposure light depending upon the sidewall of wafer holder -WT.

With this configuration , among effects which aforementioned 1 st and 2nd embodiment has had, effect of number of openings increase or effective focus depth enlargement although it isnot, has had effect to which aberration (imaging performance) adjustment of projection optical system T becomes possible in continuous .

[0051]

・・・・・第４・実施・形態・・・・・液体ＬＱ・入・・・・・・容器Ｃ１,Ｃ２・投影光学系Ｔ・一体・設・・・良・・

以上・第１~第４・実施・形態・・・液体ＬＱ・・・純水・用・・・純水・限・・・・・・・・・

Furthermore, projection optics T it is good providing vessel C1,C2 where liquid LQ is inserted in embodiment of these 4 th , as one unit.

With embodiment of 1 st ~4th above, pure water was used as liquid LQ, butthere are not times when it is limited to pure water .

・0052・

[0052]

・発明・効果・

[Effects of the Invention]

以上・示・・・・・本発明・・・・・投影光学系・結像性能・振動・・連続的・調整・・・・・・・・・・

As shown above, adjustment can be designated as continuous according to this invention , imaging performance of projection optical system without vibration.

・・・開口数・増大(或・・実効的・焦点深度・拡大)・結像性能・調整・・両立・・・・・・可能・・・・

In addition, increase of number of openings (Or enlargement of effective focus depth) with you adjust imaging performance the both achievements , it becomes possible.

・図面・簡単・説明・

[Brief Explanation of the Drawing(s)]

・図・・

[Figure 1]

本発明・第１及・第２・実施・形態・・・・露光装置・全体的・示・概略図・・・・

It is a conceptual diagram which shows aligner which depends on 1 st and 2nd embodiment of the this invention in entire .

・図・・

[Figure 2]

本発明・第１・実施・形態・・・・露光装置・要部・示・断面図・・・・

It is a sectional view which shows principal part of aligner whichdepends on first embodiment of this invention .

・図・・

[Figure 3]

本発明・第２・実施・形態・・・・露光装置・要部・示・断面図・・・・

It is a sectional view which shows principal part of aligner whichdepends on second embodiment of this invention .

・図・・

[Figure 4]

本発明・第３・実施・形態・・・・露光装置・示・概略図・・・・

It is a conceptual diagram which shows aligner which depends on embodiment of 3 rd of this invention .

・図・・

[Figure 5]

本発明・第３・実施・形態・・・・露光装置・一部・示・概略図・・・・

It is a conceptual diagram which shows portion of aligner which depends on embodiment of 3 rd of this invention .

・図・・

[Figure 6]

本発明・第４・実施・形態・・・・露光装置・要部・示・断面図・・・・

It is a sectional view which shows principal part of aligner whichdepends on embodiment of 4 th of this invention .

・符号・説明・

[Explanation of Symbols in Drawings]

Ｄ１

D1

電極

electrode

Ｄ２

D2

電極

electrode

Ｈ１

H1

配管	pipe
H2	H2
配管	pipe
I1	I1
・・・交換膜	ion exchange membrane
I2	I2
・・・交換膜	ion exchange membrane
IL	IL
照明光学系	illuminating optical system
K1	K1
隔壁	barrier
K2	K2
隔壁	barrier
L	L
排出管	discharge tube
LD	LD
導入管	inlet tube
LQ	LQ
液体	liquid
LS	LS
添加物供給管	additive supply pipe
LT	LT
・・・・・・・・	[roodaateeburu]
M	M
反射板	deflector
M1	M1
・・・・	memory
R	R
・・・・	reticle
RL	RL
・・・・・・・・	[rechikururoodaa]
S	S
光源	light source
SS	SS
・・・・	sensor

T

投影光学系

T1

駆動装置

T2

駆動装置

V

減圧管

W

・エ

WS

純水供給管

WT

・エ・・・・・

T

projection optical system

T1

drive device

T2

drive device

V

vacuum tube

W

wafer

WS

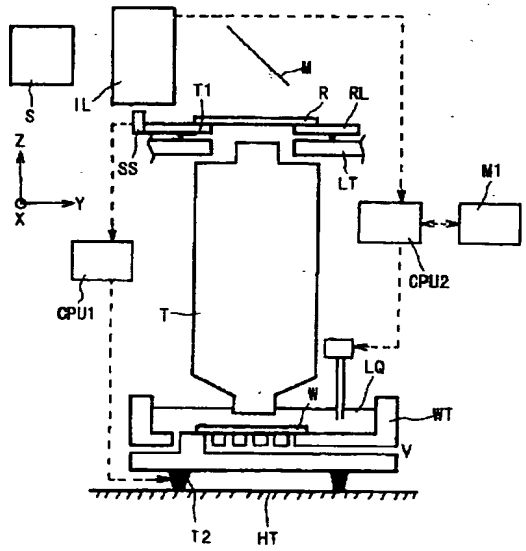
pure water feed pipe line

WT

wafer table

Drawings

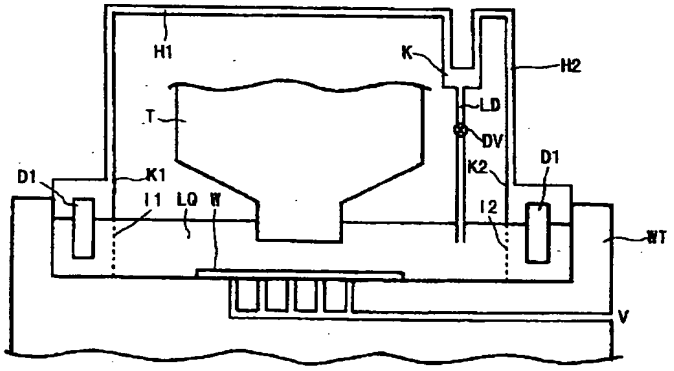
・図・・



[Figure 1]

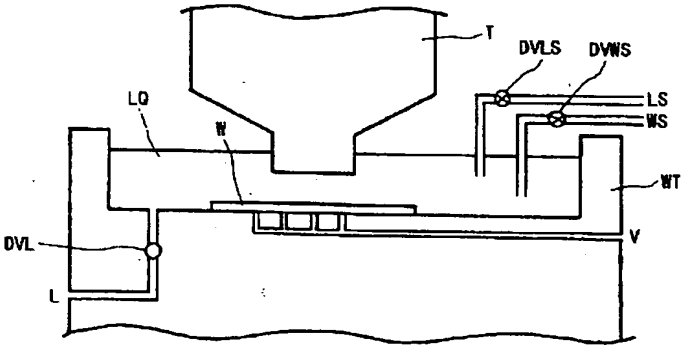
・図・・

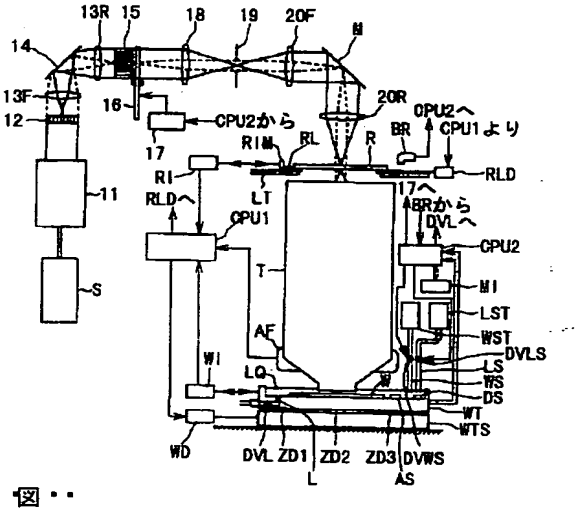
[Figure 2]



図・・

[Figure 3]



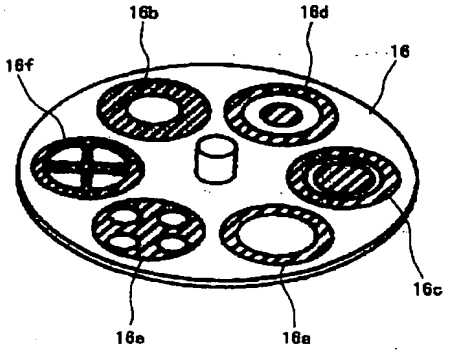


図・・

[Figure 4]

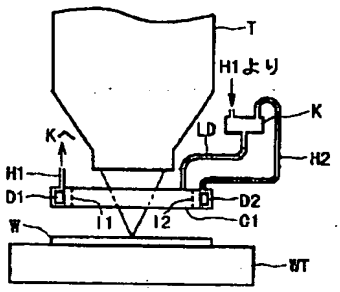
図・・

[Figure 5]

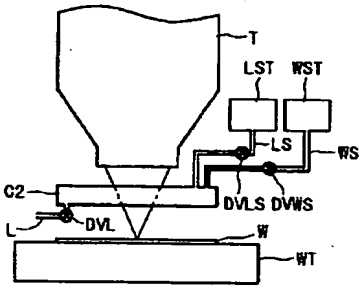

16b
16d
16
16f
16c
16e
16a

図・・ [Figure 6]

(a)


T
H1より
K
LD
K
H2
H1
D1
D2
I1
I2
C1
W
WT

(b)


T
LST
WST
LS
WS
C2
DVLS
DVWS
L
DVL
W
WT

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